

## **Efficient Modelling of Photonic Nanostructures using Krylov-subspace Methods**

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Our recently developed Krylov-subspace method provides a stable, highly accurate scheme for the numerical solution of Maxwell's equations [1]. We have amended the basic algorithm to include CFS-PML open boundary conditions and Drude-Lorentz dispersion relations that are implemented through auxiliary differential equations. Furthermore, we have implemented an extension of this method to handle nonlinear wave propagation and wave mixing phenomena as well as to deal with coupled systems. The resulting highly efficient scheme is very well suited to model most experimentally relevant photonic nanostructures where, typically, long time-scale simulations with high precision are required. This includes local field enhancement effects in metallic nanostructures as well as nonlinear wave propagation, wave mixing phenomena, and modified radiation dynamics in strongly scattering systems.

- [1] J. Niegemann, L. Tkeshelashvili, and K. Busch  
*Higher-order time-domain simulations of Maxwell's equations using Krylov-subspace methods*, J. Comput. Theor. Nanosci. (in press).